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(19) (CA) **CANADIAN PATENT** (12)

(54) Multi Function Steering Mechanism for a Motor Vehicle

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(73) Same as inventor

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ABSTRACT

The invention concerns a multifunction steering mechanism having a non-rotatable display panel located within the rim of the steering wheel. Wires of a wiring truss to the display panel are continuous through a hollow non-rotatable support shaft for the display panel. The rotatable steering shaft is off set from the support shaft and geared to a cylindercal gear hub of the steering wheel which is rotatably supported on either the support column or onto an outer housing for the mechanism.

This invention relates to a multi-function steering mechanism for a motor vehicle.

For a considerable period it has been the practice to mount control devices for various functions on a conventional steering column. There is, however, a practical limit to the number of manually actuatable switches which may be conveniently disposed on the steering column.

Attempts have been made to dispose such switches on the steering wheel itself. The vehicle horn has, for example, been disposed centrally in the steering wheel when it is not disposed on a column projecting therefrom. When only one such device is used, or even more than one device, conventional slip rings and wiper devices such as that disclosed in U.S. Patent No. 4,157,854 issued June 12, 1979 to Beauch may be used to convey electricity between the non-rotatable support column and the rotatable steering shaft on wheel for each device. When more than a very few switches are to be used, each controlling a different function, the slip ring arrangement becomes impracticable due to the limit on the number of slip rings which may be disposed between the steering wheel and the support column.

Since non-rotatable display panels within the periphery of the steering wheel are very desirable both from a design point of view and for practicality, numerous attempts have been made to solve the problems presented. The solutions provided have generally been electrically complex and sophisticated.

For example, US Patent No. 4,616,224 issued October 7th 1986 to Reighard discloses a transmitter/receiver



pair to convey information relative to the operation of devices between the steering wheel and support column; US Patent No. 4,456,903 issued June 26th 1984 to Kishi et al discloses an optical signal transmission system; US
5 Patent No. 4,438,425 issued March 20th 1984 to Tsuchida et al and US Patent No. 4,321,474 issued March 23, 1982 to Tanaka et al discloses multiplexing signals from switches on the steering wheel and a light emitting device to generate a signal in response to the
10 multiplexed output signal, a decoder unit being provided to decode the output signal of the light emitting device; and US Patent 4,635,029 issued January 6th 1987 to Yamada again utilises light to transmit information between a stationary unit and a control board mounted on a steering
15 wheel, light emitting and receiving means being provided on each of the statutory unit and the control board. Such electrical systems may be complex, expensive and sophisticated.

Various mechanical devices may be utilised to
20 maintain a display panel central of the steering wheel non-rotatable with respect thereto. US Patent No. 4,368,454, for example, discloses one such system.

An attempt has now been made to devise a simple mechanical system utilising direct connection of wiring to
25 a non-rotatable display panel within the periphery of the steering wheel, with a view to providing an inexpensive robust alternative to the various remotely operated systems referred to.

Thus, accordingly, the invention provides, in a motor
30 vehicle, a multi-function steering mechanism comprising a rotatable steering member supported rotatably on a non-rotatable support column, the steering wheel being in steering connection with at least one road wheel of the motor vehicle through a steering shaft parallel with and

off-set from the support shaft; a display panel being located within the periphery of the steering wheel and being non-rotatably mounted on the support column; and a wiring truss running within the support column,
5 individual wires of which wiring truss are directly connected to individual units of the display panel.

The support column to hold the display panel stationary may comprise a fixed column which may be tubular to house the wiring truss at least over part of
10 its length. The display panel may include a recess to house an air bag in a collapsed state, the air bag being inflatable by activating means to inflate to emerge from the recess. The inflated air bag may act to prevent the driver falling forward in the event of a crash. The
15 rotatable steering wheel member may comprise a cylindrical hub, an inner surface of which is journaled on the column for rotation.

The rotatable steering wheel member may be connected through gearing to a steering shaft axial with said
20 steering wheel. The gearing may comprise an intermediate gear shaft meshing at one end with an outer geared surface of the cylindrical hub and, at the other end, with an enlarged geared end of the steering shaft.

Embodiments of the invention will now be described by
25 way of example with reference to the drawings, in which:

Figure 1 is an illustration showing the line of sight of a driver both through a car windscreen and to a multifunction steering mechanism embodying the invention;

Figure 2 is a vertical cross sectional view through
30 a steering mechanism embodying the invention;

Figure 3 is a vertical cross sectional view through similar steering mechanism but having a display screen located on a housing of the steering column; and

Figure 4 is a vertical cross sectional view through
5 a different steering mechanism embodying the invention.

In the drawings a steering wheel number 10 is rotatably journaled on a support shaft 12. The support shaft may be fixed at a lower end 13 on any suitable part of the automobile and may carry the steering wheel at an upper end 15. The shaft 12 is hollow to carry a wiring truss 17 to a display panel 14 which is mounted at one end of the support column 12 to lie within the periphery of the steering wheel 10. Thus wires from the display panel 14 lead continuously from the respective switch or
15 display unit on the display panel to the respective controller/controlled unit with which they are associated.

The steering wheel may be of any convenient shape
20 but is conveniently circular and dished through a dish 16 which may be a continuous surface or comprise one or more spokes so that a front face of the display panel 14 is either flush with or slightly recessed from the plane of the steering wheel 10. The steering wheel 10 is provided
25 with a hub 18 journaled onto support column 12 by bearings 20. An outer cylindrical surface of hub 18 is geared to mesh with corresponding gearing on an end 22 of an elongate steering shaft 24.

The end 22 may be enlarged with respect to the shaft
30 to provide for good engagement with the gearing of the outer cylindrical surface of hub 18. The gearing between hub 18 and end 22 of shaft 24 may be of any suitable type, for example toothed gearing, and will not be described in detail. Steering shaft 24 is rotatable about

its longitudinal axis in bearings 26, 28 by rotation of the steering wheel 10 and hub 18 such that the gearing on the outer surface of the hub 18 meshes with the gearing on the end 22 of the steering shaft 24 to turn it. The
5 bearings 26, 28 are conveniently carried on support column 12. The lower end 27 of steering shaft 24 may be similarly geared to a head 29 of a main steering shaft 30 coaxial with the support column 12 and hence with steering wheel 10. By this means, an angle of turn of
10 steering wheel 10 may provide a similar degree of turn in main steering shaft 30.

This may be a convenience in fitting steering mechanism according to the invention into an automobile which has been designed for coaxial operation of steering
15 wheel and steering shaft. However, in principle, it is not of importance whether the lower end 27 of steering shaft 24 is geared to the head 29 of drive shaft 30, or whether drive shaft 24 replaces steering shaft 30 to actuate further conventional mechanism to translate
20 turning motion of steering wheel 10 to turn road wheels of an automobile.

Since support column 12 is stationary, the wiring truss 17 or parts of it may be led out of it at any convenient point. For example, as shown, the wiring
25 truss may be led out of the support column 12 via port 32 forward of a dividing wall 34 between the driving compartment 35 and the engine compartment 36. Once in the engine compartment or other location such as that shielded from the driving compartment by the dash board.
30 The wiring truss 17 may be divided into smaller trusses or individual wires which may then be led in different directions to their destinations.

At least within the driving compartment 35, it may be convenient to enclose the support column 12 and the drive

shaft 12 within a housing 38. When the steering wheel 10 is journaled for rotation on support column 12, as shown in Figure 2, there is no reason why housing 38 must be of circular cross-section. Indeed it may be as shown in
5 Figure 1 of almost pear-shaped cross-section with the steering shaft 24 located in the small end of the pear. At the lower end the housing 38 may be connected with the dividing wall 34 between the driver compartment and the engine compartment. Alternatively, it may pass through
10 the wall 34 and terminate at any convenient point. At its upper end the housing 38 must terminate without fouling rotation of steering wheel 10. Figures 2, 3 and 4 show the upper end of housing 38 terminating abruptly just short of spokes 16 of wheel 10. However, any
15 arrangement that does not foul the rotation of wheel 10 may be envisaged.

In particular, as shown in Figure 4, shows an embodiment in which the rotation of wheel 10 is journaled on the housing instead of on the support column 12, and
20 in this case, bearings 26, 28 may be carried on the housing 38. It is therefore possible to make support column 12 less robust since its only function is to house wiring truss 17 and to carry display panel 14. However, in this case, the housing 38 must be of circular
25 cross-section, at least internally, for rotation of the hub 18.

The display panel 14 may have a circular periphery and may take up effectively all the space within the periphery of steering wheel 10. However, it may be
30 preferred that a portion of the space within the steering wheel 10 be left unobstructed for the location of a recessed screen 40, within the periphery of the steering wheel and set back from it to be free of glare. Such screen is shown diagrammatically in Figure 1 in line of
35 sight with the driver's eye 41. In Figure 1 and Figures 2

and 4 the screen is set in a top recess of display panel 14 towards the deepest part of dish of steering wheel 10. The forwardly projecting part of the dish which in this case is preferably a continuous surface, acts as the light shielding hood 42, so that light does not interfere badly with any display on the screen.

It may be provided with hood 42 to shield the screen from glare. Since not all drivers are of the same height, it will be necessary to provide adjustment means for screen 40 so that it is comfortably viewable for all drivers. Such as by providing means for tilting the steering wheel, adjustment means may be conventional, and do not themselves form part of the invention and will not be discussed in detail. It is appropriate to comment here that tilting of the steering wheel 10 for the embodiment of Figure 2 may easily be accomplished by provision of coordinating tile joints in both the support column 12 and the steering shaft 24.

It may be convenient that the hood 42 and screen 40 be carried by the steering column housing 38 by, for example, as shown in Figure 3. Adjustment of the screen may be by adjustment means (not shown) between housing 38 and hood 42. In this case the dish 16 of wheel 10 may preferably be a single spoke, located at the bottom of the wheel 10 in the straight steering position. Such a spoke is less likely to obscure the view of display screen 14 or turning the wheel 10. The screen 40 may be used for the display of information such as maps, directions and the like, the actual display being provided from a video tape or other display means.

The display panel 14 shown in Figure 1 may conveniently have control switches 44 around its periphery so that they are within easy reach of the driver's fingers. Moreover, a car telephone may have a telephone instrument 50 hingedly mounted on the display

panel as a speaker phone. In a "hung-up" position for non-use the instrument lies flat against the display panel 14. When it is desired for use, it may be hung downwardly to take it off the hook and be available to receive and transmit. A dialing pad 52 may be loaded adjacent. Behind display panel 14 an air bag 39 may be tightly packed between the panel 14 and dish 16. A recess at the bottom of the display panel allows the inflating bag to flow into the driving compartment to act as a safety cushion in the event of a crash or sudden stop. Actuation of inflation or flow into the driver compartment may be either automatically activated by sudden deceleration or by manual actuation. However, it is to be understood that the illustration is in no way intended to limit the form of the display panel which may be designed in various forms depending on the information which is to be displayed and the control switches which are to be carried thereon.

PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

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1. A multi-function steering mechanism for a motor vehicle including a display console comprising a rotatable steering wheel, the steering wheel being in steering connection with at least one road wheel of the motor vehicle through a steering shaft parallel with and off-set from the support shaft; a display panel being located within the periphery of the steering wheel and being non-rotatably mounted on the support column; and a wiring truss running within the support column, individual wires of which wiring truss are directly ^{connected} to individual units of the display panel.
 2. A multi-function steering mechanism as claimed in claim 1, in which the steering wheel is journaled for rotation on the support column.
 3. A multi-function steering mechanism as claimed in claim 2 in which the rotatable steering wheel includes a cylindrical hub, an inner surface of which is journaled on the support column for rotation.
 4. A multi-function steering mechanism as claimed in claim 3, in which the rotatable steering wheel mechanism is connected through gearing on the outer surface of the cylindrical hub to the steering shaft for rotation of the steering shaft about its longitudinal axis.

5. A multi-function steering mechanism as claimed in claim 4, in which the steering shaft meshes at one end with an outer surface of the cylindrical hub.

6. A multi-function steering mechanism as claimed in claim 1, in which the steering shaft and support column are housed within a tubular housing.

7. A multi-function steering mechanism as claimed in claim 5 in which the rotatable steering wheel is journalled for rotation on the housing.

8. A multi-function steering mechanism as claimed in claim 7 in which the rotatable steering wheel includes a cylindrical hub, an outer surface of which is journalled on the housing for rotation.

9. A multi-function steering mechanism as claimed in claim 8 in which the rotatable steering wheel is connected through gearing on the inner surface of the cylindrical hub to the steering shaft for rotation of the steering shaft about its longitudinal axis.



10. A multi-function steering mechanism as claimed in claim 5, in which the steering wheel is concave, and the display panel is located in the resulting concavity.
11. A multi-function steering mechanism as claimed in claim 1 in which the display panel includes a recessed display screen.
12. A multi-function steering mechanism as claimed in claim 1 in which the display panel includes a recess housing, an inflatable air bag, actuating means being provided to inflate the air bag whereby it emerges from said recess.
13. A multi-function steering mechanism as claimed in claim 1 in which the display panel includes a speaker telephone hingably movable between an "on-hook" position and an "off-hook" position.

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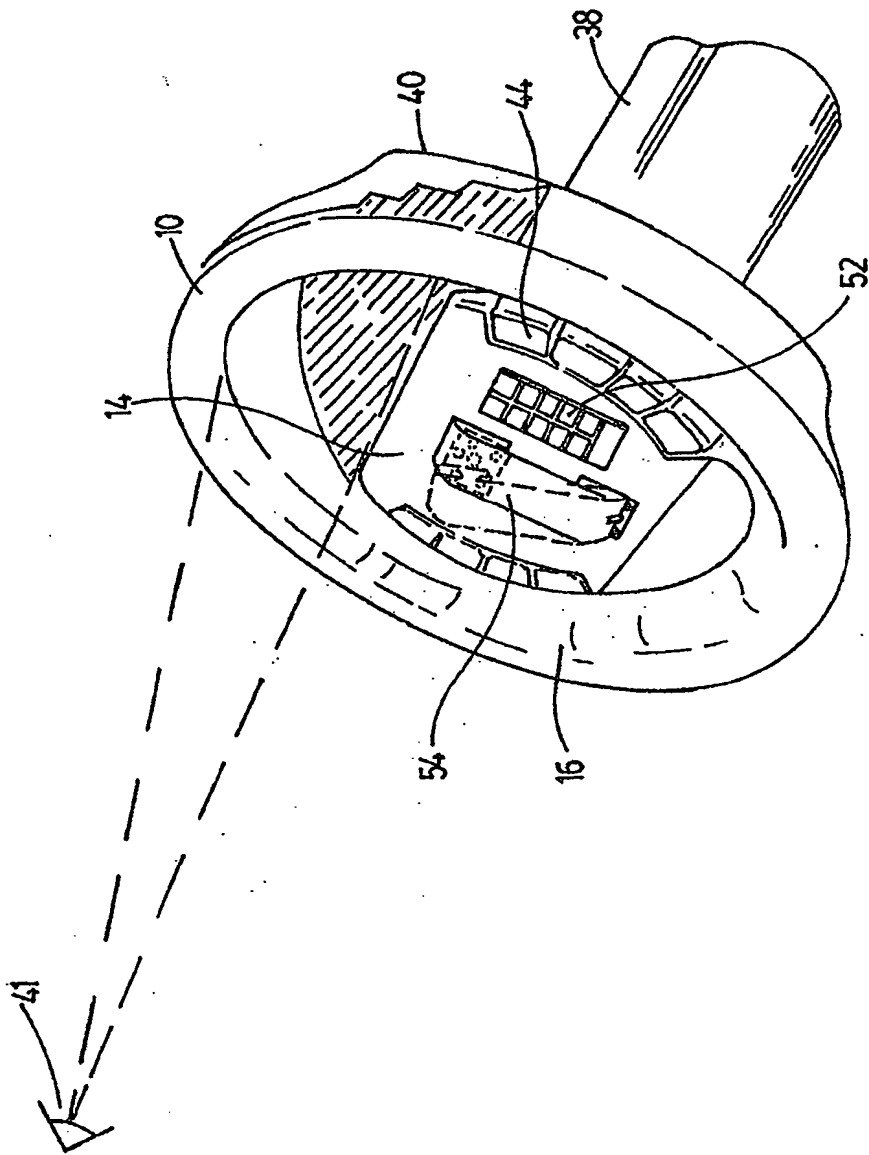


FIG. 1

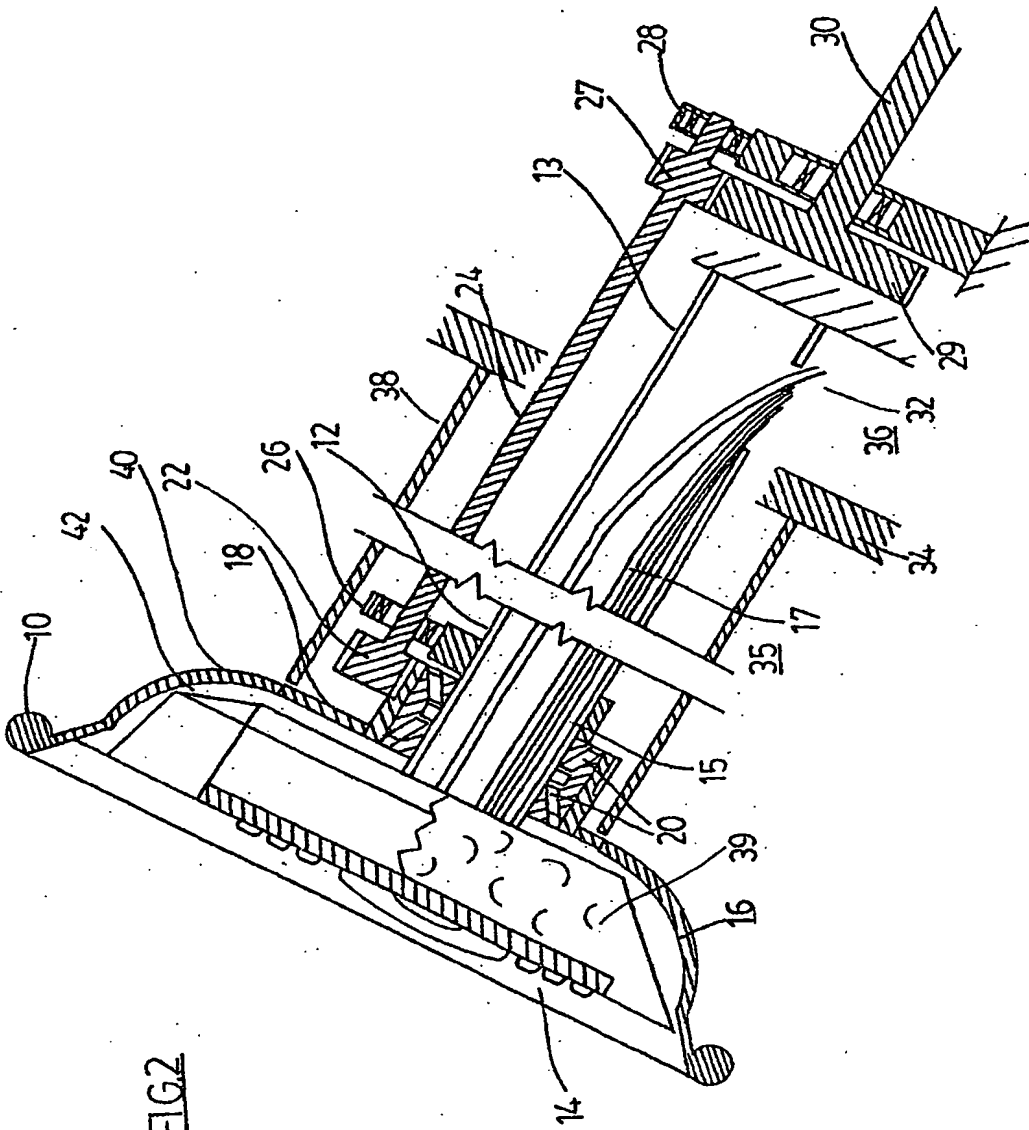
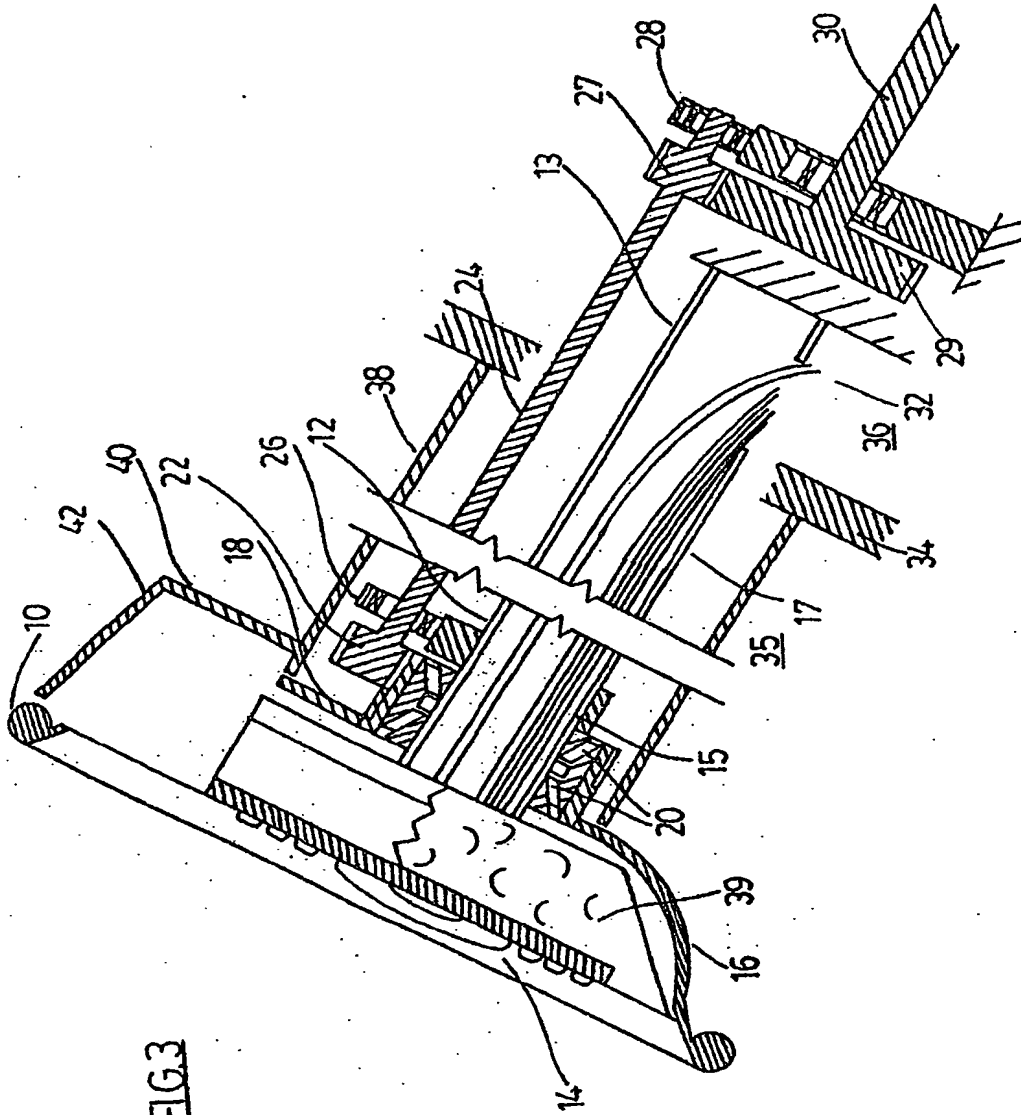


FIG 2

2#

Forwards Buck & Blade



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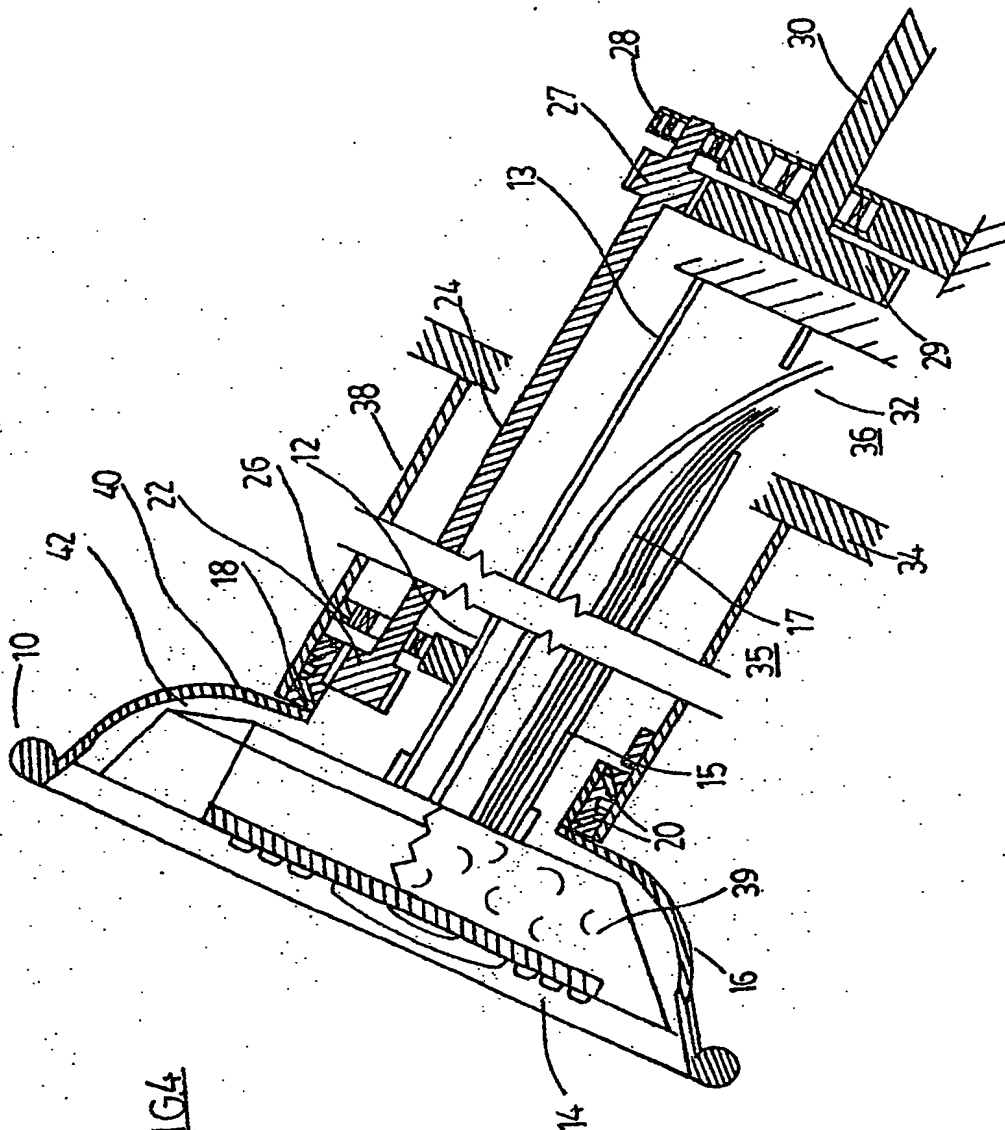


FIG 4

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